CLINICAL EVALUATION OF VARIOUS ANAESTHETIC TECHNIQUES FOR THE WELL BEING OF MOTHER AND CHILD IN CAESAREAN SECTION

THESIS
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CERTIFICATE

This is to certify that the work entitled "A clinical evaluation of various anaesthetic techniques for the well being of mother and child in caesarean section", which is being submitted as a thesis for M.D. (Anaesthesiology) by Dr. Asha Katoch, has been carried out under my personal supervision and guidance. Selection of the patient and techniques embodied in the thesis are undertaken by the candidate herself and the observations recorded by the candidate have been checked by me from time to time.

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INTRODUCTION

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Caesarean Section is almost certainly one of the oldest operation in surgery with its origin lost in antiquity and in ancient mythology. Most early caesarean sections were accomplished after the death of the mother in an attempt to save the life of the child.

Today caesarean section is being done with increasing frequency because, properly executed it carries little more risk for mother and often less risk for the infant than the marginal delivery attempted in presence of obstetric complications. The incidence of caesarean section in various hospitals is reported to be four to nine percent (Bonica 1969) of total births.

Ever since the first use of anaesthesia for caesarean section a century ago the anaesthetic management of parturients undergoing abdominal delivery have posed a special challenge to the anesthetists. Nowhere else is the physician confronted by two patients simultaneously-the one visible and the other relatively unknown. If the reactions of infants, always mirrored that of the mother, there would have been a few problems. However such is not the case for it has been shown that the lack of maternal depression does not preclude severe depression of the infant at delivery.

The technique of anaesthesia for caesarean section must meet the maternal essentials like efficient oxygenation, protection against aspiration of regurgitated or vomitted gastric contents, freedom from distress and adequacy of myometrial contractility following delivery. The foetal requirements are-adequacy of utero-placental perfusion with oxygenated blood, efficient

exchange of respiratory gases, avoidance of metabolic acidosis and of central nervous system depression due to drugs administered to mother.

Today, as in the past there exist great differences of opinion regarding the anaesthetic of choice in caesarean section. This is not surprising in view of the wide spectrum of training, competence and philosophies of anaesthesiologists and obstetricians. Despite the remarkable advances in anaesthesia there is at present no ideal anaesthetic technique for all parturients undergoing caesarean section. There has recently been an increasing interest in exploring the subtle neonatal effects of drugs used for maternal sedation on analgesia during caesarean section.

The present study was therefore undertaken to evaluate the effects of commonly practised anesthetic technique on the clinical condition and well being of the mother and child following caesarean section.

REVIEW OF LITERATURE

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Origin of the term caesarean section is obscure. Although generally believed,but it is unlikely,that the term is derived from "Julius caesar" (Borin in 100 BC), or the Roman Law 'Lex regia' (Eighth century). Existence of such operation is not even mentioned by Hippocrates, Galen, Celsus or any other medical writer of that time (Williams obstretics).

Caesarian section on dead was practised soon after christian church gained dominance,as a measure directed at baptism of the child. The first authoratative report about the early use of this operation was published in 1668 by the great french obstretician francois mauricean. The report shows that the operation was performed on the living in rare and desperate cases and was usually fatal. The situation was same till the end of 19th century because the suturing of uterine wall was not known at that time.

The turning point in evolution of caesarean section came in 1882 when Max Sanger introduced suturing of uterine wall. First use of extra peritoneal approach by Frank in 1907 and lower segment approach by Back in 1919 is history by itself. Kerr in 1926 introduced transverse incision which is the most commonly employed incision today (Willians obstritics).

First use of anaesthesia for caesarean section was done a century ago. During the second half of the nineteenth century, chloroform and ether were used almost exclusively. Maternal deaths due to aspiration of gastric contents and cardiovascular collapse occured occasionally. Moreouer, because the anaesthetic

was often administered in high concentration for intra-abdominal sugery, it undoubtedly produced severe depression of the neonate.

Spinal analgesia for caesarean section was first used in 1900 by Doleris and Malartic and lumbar extradural analgesia was described by Pickles and Jones in 1928,Despite their theoretical advantage over general anaesthesa practised at that time, regional blocks were infrequently used till fourth decade. However with improved technique later, the regional blocks became more and more popular. During the period between 1935 to 1942, out of 562 consecutive caesarean section 345 were given spinal analgesia in Israel Zion hospital (Frederick Wein-traub,1942) with out a single mortality attributable to anaesthetic. Spinal analgesia was considered superior to other forms of local or general anaesthesia, because of rapidity of administration, relative rapidiity of effect, more complete anaesthesia and early post operative tolerance of fluids. The disadvantage being episodes of retching and Hypotension that followed spinal analgesia.

Hellamn et al (1944) gave an account of 1415 deliveries, including caesarean, in which thiopentone Na upto 2 gms was used. Foetal mortality where foetus was known to be alive before commencement of anaesthesia was 2.4 percent. They also measured maternal and foetal blood levels of thiopentone in some cases and concluded that there was a delay of about 12 minutes before foetal thiopentone level became equal to maternal level and they claimed that if the delivery was delayed beyond this time foetal blood concentration of thiopentone might reach dangerously high level.

Cohen et al (1953) reported that the time taken over the delivery was of little consequence in relation to degree of neonatal depression and indeed the longer the lapse of time the less is the likelihood of the drug affecting the neonate . Crawford et al (1956) in their study found that there was no clinical evidence of foetal depression attributable to anaesthesia what ever is the length of time between induction and delivery.

There was no standard method for assessment of newborn upto 1952. and terms like asphyxiated baby and apnoeic baby were frequently used to express the condition of neonate. Virginia Apgar (1953) described a method of evaluation of the newborn infant in 1952. which is the standard method of assessment of clinical condition of the neonate even today. She described five objective signs which pertained to the condition of the newborn and a rating of zero, one or two was given to each sign depending upon whether it was absent or present.

The signs used are heart rate, respiratory effort, reflex irritability, muscle tone and colour,A score of ten indicates a newborn is in best possible condition. The Apgar score method was further analysed and developed by Apgar and James (1962) and crawford et al (1973). It was observed that the color is the most unsatisfactory sign. All infants are more or less cyanotic at birth because of their high capacity for carrying oxygen and relatively low oxygen content and saturation chart of Apgar score.

The technique of balanced anaesthesia using a sequence of oxygen, thiopentone suxamethonium followed by endotracheal intubation with a cuffed tube and nitrous oxide-oxygen. (6:4) was described by Hodges and Tunstall (1961). No other drug was used

before delivery of the infant except intermittent injections of suxamethonium if required. They claimed that this technique produced minimal foetal depression and is superior to conduction blocks. Virginia B.Hartridge and Robert B Wilson (1963) proposed a similar technique for balanced anaesthesia. In their technique muscle relaxation was obtained by an intravenous drip of 0.2 percent suxamethonium. This remains the most popular technique of general anaesthesia for caesarean section even today. Montgomery (1961) compared this technique with the sequence of thiopentone, suxamethonium, Nitrous oxide-oxygen and Halothane. He found that the latter causes more foetal depression.

J. Selwyn Crawford (1962) proposed a method of evaluating a technique of anaesthesia for caesarean section. He deplored the indiscriminate comparison of techniques for caesarean section by use of a mass of unselected data.He observed that incidence of neonatal depression varies markedly with the degree of obstretric complications, whatever may be the technique of anaesthesia used. So he suggested that when technique of anaesthesia for caesarean section are compared, reference must be made to the obstretric factors involved.

Hyperventilation has been used as an aid to production of unconsciousness but the respiratory alkalosis thus produced in mother may however causes lowering of foetal Po2, a delay in the onset of normal respiration and a low Apgar scores at 1 minute (Holmes Frank 1963). But Coleman (1967) and Scott et al (1969) did not observe any harmful effect on the neonate due to hyperventilation in mother.

In a series of cases of elective caesarean sections, general anaesthesia (Standard technique of balanced anaesthesia) and

spinal analgesia was compared (Crawford,1966). It was found that when allowance was made for the extent of the induction-delivery interval, the infants delivered under general anesthesia were less asphyxiated at delivery than those delivered under spinal analgesia. It was suggested that this is reflective of the action of the obligatory vasopressors on the Utero-placental hemodynamics,On the other hand Shnider et al (1968) demonstrated in eves that ephedrine arrested or even corrected the foetal acidosis resulting from post spinal hypotension.

Maternal hypotension during spinal analgesia for caesarean section has been a persistent problem and there are evidences that foetal deterioration can result (RICHARD AND CLARK et al, 1976). It was suggested that this should be prevented with infusion of of 5 percent dextrose in ringers solution combined with left uterine displacement when spinal analgesia is used for caesarean section. Reports by Greiss and Crandell (1965) and by Wollman and Marx (1968) have also indicated that post spinal hypotension in pregnant woman can safely be treated as well as prevented by the rapid intravenous infusion of balanced electrolyte solutions, so that drug therapy may be unnecssary. E.V Cosmi and G.F Marx (1969) compaired general anaesthesia and spinal analgesia with treatment of hypotension by forced hydration and spinal analgesia with prophylactic hydration produced more favourable biochemical and clinical condition of newborn than spinal analgesia with therapeutic hydration. The general anaesthesia was associated with a higher incidence of neonatal depression than either of the spinal analgesia group.

To improve foetal oxygenation during caesaream section Rorke et al (1968) studied the effect on neonate of giving 33, 66 and 100

percent oxygen during anaesthesia to the mother. They observed that the foetal oxygenation can be improved by increasing maternal Paco2, but to a maximum level of about 300 Torr. which can be achieved if inspired gas mixture has about 55 percent oxygen. Above this level of maternal Paco2 foetal oxygenation deteriorates probably due to vasoconstriction in placental vasculature in response to high Paco2. They observed higher Apgar score in infants born to mothers who were given 66 percent oxygen. Anis Baraka (1970) advocated maternal hyperventilation with 50 percent oxygen in inspired gas mixture for optimal foetal oxygenation. But when a high oxygen concentration with less nitrous oxide is used then some supplementary anaesthesia is often required to ensure unconsciousness of the mother. DD moir (1970) used halothane for this purpose. He compared nitrous oxide-oxygen in ratio of 70:30 unsupplemented and 50:50 with 0.5 percent halothane. High incidence of low Apgar score (1 to 3) was noticed in the first group and there was no suggestion that 0.5 percent halothane causes neonatal depression. In fact it improves the condition of the neonate by allowing a higher concentration of oxygen to be administered.

Anis Baraka (1971) compared the incidence of neonatal depression when either propanidid or thiopentone was used for induction of general anaesthesia for elective caesarean section. They reported that the incidence of neonatal depression was higher in the thiopentone group than in the propanidid group, particularly when the induction delivery time was prolonged more than 10 minutes. This was attributed to the different fates of these drugs. Earlier Bradford et al (1969) had got similar results. Other intravenous anesthetic drugs were Studied for

using as induction agent in caesarean section like ketamine by Meer et al (1972) and Althesin and downing et al (1974). Although they did not have any depressing effect on the newborn but they did not offer much advantage over the most commonly used induction agent- Thiopentone. While studying the effect of time and lateral tilt Crawford et al (1972) observed greater degree of neonatal asphyxia in non-tilted patients than those who were even given left lateral tilt on operation table.

This disparity was increased with prolongation of induction-delivery interval. Time factor was earlier studied by R Kalappa et al (1971) and Stenger et al (1969). They also got similar results. The latter author attributed the depression of neonate to significantly elevated nitrous oxide concentration in the newborn infant.

I Kivalo and S Saarikoski (1976) studied the placental transfer of curare and advocated that since curare is able to cross placenta in small but detectable amounts, it is better for the foetal well being to exclude the drug before the delivery especially when the foetal compromise is suspected.

There has been recently an increasing interest in exploring the subtle neonatal effect of drugs used for maternal sedation or analgesia. Scanlon et al (1974) suggested that neurobehavioral testing may present a valuable way to assess the effects of the maternally administered drugs on the new born infant. This can assess the effect of a more subtle nature than can be measured by Apgar scoring alone. They also devised a neurobehavioral examination which has proved to be simple,rapid and reproductable technique of assessing some aspects of the new born behaviour in the early hours of life.

Downing et al (1979) compared epidural and general anaesthesia for caesarean section. Neonatal acid-base values and Apgar score showed no significant differences between the two groups. Hollmen et al in 1978 got similar results. They also compared the neurobehavioral response of infant and found that all infants of high risk obstetric patients, independent of the anesthetic technique used, had abnormal neurological activity. There was a significant correlation between the depression of neurological activity and maternal hypotension. They also suggested that while comparing the effects of anesthetic techniques on the neonate, in addition to acid-base values and Apgar score,infants neurological recovery which is a more sensitive index of neonatal well being, should be used.

Studying the placental blood flow during caesarean section under lumbar extradural analgesia,Jouppila et al(1978) found that it decreases by 13 percent and despite this all new born infants were in good clinical condition, because of healthy foetus can tolerate well upto 50 percent reduction in placental blood flow for a short duration. They suggested that it may cause abnormal neurobehavioral recovery of the newborn infant, but Cork et al (1982)found no effect on clinical condition or neurobehavioral of new born due to post spinal maternal hypotension of short duration (less than 2 minitus)

Several studies have compared the condition of infants delivered by elective LSCS under General Anaesthsia with that of regional analgesia was provided (Datta and Brown 1977, James et al 1977, Palahniuk et al 1977, Hollman et al 1978, Downing,Houlton and Barclay, 1979 Fox et al(1979) the opinion of the majority was that infants delivered under regional

anaesthesia were comparatively better condition giving consideration to U-D interval but not considering the presentation of the infant at the time of caesarean section U-D interval was relatively prolonged in extra dural block. When the U-D interval was less than 90s the infant born under extradurl analgesia was more acidotic than those born under general anaesthesia.

The requirement of adequate oxygenation and minimal drug induced depression of foetus at delivery, and avoidance of intra operative maternal awareness is an ideal general anaesthetic technique for caesarean section. The use of 50% Nitrous oxide in oxygen, with the addition of low concentrations of volatile agents represents current practice. E.G LAWES, B Newman, M.T Campbell, M Irwin, S Dolsuska and TA Thomas in 1988 did a comparative Study of 50% and 33% groups. No difference were found between 1 or 5 Min Apgar score or TSR Values. It was concluded that no difference in fetal outcome or acid- base status can be detected when maternal F Io2 is decreased from 0.5 to 0.33, and that the use of 33% oxygen in 66% nitrous oxide appears to be safe for neonates who have not sufferd foetal distress before delivery.

DG Bogod, M Roseu ad G.A.D Rees did a study on maximum FIO2 during caesarean section giving 100% oxygen and did comparative study with a group getting 50% oxygen.The umblical venous PO2 in the oxygen(100%) only was higher than the oxygen Nitrous oxide group. Blood loss and uterine contractibility was unaffected by increased conc of volatile agents. Improved cardiovascular stability was seen in the elective high oxygen group.

During pregnancy metabolic rate and CO2 production increase by 30-33%. In addition hyperventilation occurs, causing reduction in CO2 tension (Pa CO2) to 3.9 - 4.2 KPa. These effects are present from 12 week gestation-both these factors produce an increase in the awake resting minute volume of pregnant patient between 42% and 57%. Moreover much more marked hyperventilation can occur during labour. These metabolic and respiratory changes persist for 2-14 days in post partum. A J Rampton, S Mallaiah and CPO Garrett did a study on increased ventilation requirement during obstetric general anaesthesia in which they found if the FGF of 121 ml per Kg/min and 109 ml per Kg min after delivery was essential to maintain 57% and 42% resting minute volume.

The period of labour, delivery and first minute after birth carry a high risk of asphyxia. The newborn infant must successfully inflate and adapt the lungs to the neonatal circulation immediately after birth. This complex physiological process can be adversely affected by many factors-including maternal analgesia and anaesthesia. J F Murphy, M Duncey, G A D Rees, M Rosen and OPG Ray 1984 did a study on obstetric analgesia, anaesthesia and the Apgar score. The Apgar score of babies born in epidural block was significantly better, the Apgar score of infants born of caesrean section was low comparatively in 40% cases.Likely causative factors include undue sensitivity of infants respiratory centre and aortocaval compression during surgery.

G F Marx, W M Luykx and S Cohen in 1984 did a comparative study of neonates delivered by elective caesarean section under regional and general anaesthesia. They have demonstrated better clinical outcomes with regional techniques. Apgar-minus-colour

scores were lower and time-to-sustained respiration longer in infants born under general anaesthesia than in babies born under extradural block.

The study was done by Allen, S Maigaard, JH Christensen, F Andreasen and A. Forman in 1987 in which they studied the effect of thiopentone or chlormethiazole on human placental stem villous arteries. The concentration of the two drugs needed to affect contractile activation of isolated human stem villous arteries exceeded the free plasma concentrations reached during anaesthesia induced by the agents during caesarean section. The results do not suggest any major effects of thiopentone or chlormethiazole on foetal placental vascular resistence during chemical use of these drugs.

Cardiac output changes during caesarean section - a study was done by B Newman in 1982. He found by Transcutaneous aortovelography (TAV) - a non - invasive Doppler ultrasound technique for measuring flow velocity of blood in the transverse thoracic aorta. There is increase in cardiac output after induction and commencement of surgery(mean 19% $P< 0.05$) and after delivery was found.

R. Jouppila, J Puolakka, A. Kauppila and J. Vuori in 1984 did a study on maternal and umblical cord plasma noradrenaline concentrations during labour with and without segmental extra dural analgesia, and during caesarean section. It was found that umblical venous and arterial concentrations of nor adrenaline were lower after caesarean section than after vaginal delivery. However, extradural analgeaia did not affect the foetal noradrenaline concentrations. Since noradrenaline is required for

the adaptation of the newborn to extrauterine life. the unaltered fetal response may be beneficial.

Hypotension during Epidural anaesthesia for ceasarean section is a known phenomenon.A study was conducted by D. Hallworth, J.A Jellicoe and R.G. Wilkies in 1982 in which a comparison of intravenous loading with crystalloid and colloid solution was done. In one group a preload of 1 litre of Hartmann's solution was done and in other group pre-load of 0.5 litre of Haemaccel (Polygelatin) and 0.5 litre of Hartmann's solution was done. Hypotension occurred in 45% cases in Hartmann's group but in only 5% of the polygelatin and Hartmann's group.An arguement for the use of 2 litres of intravenous preload of crystalloid solution is offered to provide prophylaxis against Hypotension occurring during caesarean section under epidural anaesthesia.

A.G. Davis, MB, Ch B,FFARCS consultant Anaesthetist Southern General Hospital Glasgow gave a report in 1982. The reports of inqueries into maternal mortality show that general anaesthesia remains a prominent cause of maternal deaths. The almost universal association with avoidable factors makes these deaths particularly regrettable. Most of these deaths due to anaesthesia have been caused by acid aspiration syndrome or hypoxic cardiac arrest associated with difficult or failed tracheal intubation, and it is now well recognised that the avoidance of general anaesthesia wherever possible must be a major part of the strategy in preventing further such tragic deaths in young women.

Properly administered regional block not only overcomes the problems of failed tracheal intubation, acid aspiration

syndrome and awareness during general anaesthesia but also carries the advantages of greater maternal satisfaction and post operative well being, and a more vigorous condition of the baby at birth. Against these advantages are drawbacks, namely the length of time taken to induce an epidural block, and the lack of universal acceptability. It is important to assess the incidence of these problems. Patients who are at risk from haemorrhage or coagulopathy will continue to require general anaesthesia.

MATERIAL AND METHOD

MATERIAL AND METHOD

This study was conducted at Maharani Laxmi Bai Medical College and Hospital Jhansi. Fifty five parturients undergoing caesarean section were included in the study. Cases with maternal distress or abnormality were excluded from the study. On the basis of the anaesthetic technique used, the cases under study were divided into four groups, namely - spinal anaesthesia, epidural analgesia, general anaesthesia with spontaneous and controlled ventilation.

Table -I Shows the number of cases, maternal age, parity, period of gestation, infants sex and birth weight in each group.

Table-I

Characteristics of the study population

	General Anaesthesia		Regional Analgesia	
	Spontaneous GP I 15	Controlled GP II 15	Spinal GP III 15	Epidural GP IV 10
Maternal age				
Mean	22.5	21.7	22	23.3
Range	(19-30)	(20-25)	(19-25)	(20-29)
Parity				
Mean	1.7	2.6	2	1.7
Range	(1-4)	(1-5)	(1-3)	(1-3)
period of Gestation				
Mean	39.0	38	38.9	39.2
Range	(37-42)	(37-41)	(37-41)	(38-40)
Infants Sex				
Male	10	8	8	5
Female	5	7	7	5
Birth Weight(Kg)				
Mean	2.6	2.5	3.1	2.6
Range	(2.2-3.6)	(1.4-3.0)	(1.5-3.5)	(2.0-2.9)

Indications for caesarean section were cephalo-pelvic disproportion, previous caesarean section or abnormal presentation .

Pre-operative

All parturients who were scheduled to undergo caesarean section were subjected to detailed pre-anaesthetic check up half an hour before surgery. All patients were asked the history of oral intake-if the patient was starving and if time permits half hour to 45 min before surgery 0.6mg Atropine sulfate was given intramuscularly. If there is history of oral intake then gastric tube was passed and gastric suction was done.In such cases I/V Atropine 0.6 mg was given 2-3 minutes before induction. No sedative or narcotic was given in pre-medication.

Technique of Anaesthesia

On the basis of the technique of anaesthesia used the cases were divided into four groups. Details of technique in each groups is as follows.

Group I (General Anaesth with spontaneous Resp)

All patients were in supine position on an operation table with a pillow under the occiput. Blood pressure and pulse were recorded.Intravenous drip of 5% Dextrose or Isotonic solution was started.

Pre-oxygenation was done for 3-4 minutes to all patients and during this time skin preparation and drapping was completed by obstretrician. Induction was done with a sleep dose of thiopentone sodium -a 2.5% solution in doses of 4-5 mg/kg body weight. This was followed by suxamethonium in doses of 1.5 mg to 2.0mg/kg body weight about 100 mg was loaded and given.Intubation with a cuffed endotracheal tube was smoothly and swiftly carried out following

which the operaton started. The cuff of the endotracheal tube was then promptly inflated ensuring the aeration chest expansion equal on both sides. Anesthesia was maintained with Nitrous oxide and oxygen (5.5 liters per minute) and intermittent positive pressure ventilation using Magills circuit till the foetus was delivered. In most of the patients the initial dose of suxamethonium provided sufficient relaxation till the foetus was deliverd-after which ether as inhalational anesthetic was also supplemented along with Nitrous oxide and oxygen mixture till final suturing was done. Ether supply was shut off once peritoneum was closed.After skin suturing Nitrous oxide was closed,later for 5 minutes 100 % oxygen was given when extubation was done and oral cavity cleaned and sucked well of all secretions.

Guoup II (General Anaesthesia with controlled Ventilation) Blood pressure and pulse were recorded before the start of the procedure. Again I/V of 5% dextrose was started. Pre-oxygenation of patient for 4 to 5 minutes till the patients part is prepared by surgeons along with drapping. Induction with 2.5% Thiopentone sodium in doses of 250mg to 300mg followed by 100mg suxamethonium. Intubation with a cuffed tube. Once the spontaneous ventilation starts vecuronium/gallamine were used in doses of 2-4 mg /40 to 80 mg till the surgery was over supplementing with nitrous oxide and oxygen (5:5 liters/ml) After a delivery of the infant - pain killer like fortwin 10-20 mg I/V or 10-20 MG I/V pathedine was used .

Group III (Special group-Subarachnoid block)

Blood pressure and pulse rate were recorded before the start of the procedure. Intravenous drip started with fast infusion of 5%

Dextrose followed by normal Saline/Ringers lactate 540ml. Patient was put on an left lateral position with spines flexed. Area was cleaned thoroughly and a skin weal raised with the injection of lignocaine 1% solution in L3-L4 interspinous space. For spinal injection a 20 SWG needle was mostly used. when tip of the needle enters into the subarachnoid space a free flow of CSF is observed. Bupivacaine (Marcain) in doses of 0.8 to 1 ml was injected or 5% lignocaine-Patients table was tilted left laterally to prevent compression of inferior vena cava by the the gravid uterus.Another 500ml of Ringers lactate or 540ml of normal saline was infused rapidly After the injection of spinal block and lateral tilt of the table the surgeon was asked to commence the operation. Pulse rate and blood pressure were recorded every five minutes till the delivery of the infant and also after delivery. Injection calmpose 5 mg I/V was given as sedation after delivery of the foetus along with ergometrine and oxytocin in a drip.

Group IV (Lumbar epidural Analgesia group)

Patient was put on left lateral position similar to group III. Under all aseptic precautions needle was placed in epidural space. A 18 SWG Tuoy's needle was used for the injection.

Epidural space was identified by sudden loss of resistence to the advancing needle, confirmed by loss of resistence to flow of air pushed by a 5ml dry syringe.16 to 18 ml of 1.5 percent lignocaine with adrenaline was injected slowly.

After this patient was returned to supine position and immediately blood pressure and pulse rate were recorded.

Pulse and blood pressure were recorded every 2 minites till the delivery of foetus. After ascertaining the success of the block, operation was commenced.

Assessment of Neonate

Apgar scoring system was used for assessment of newborn infant. Score was noted exactly after 1 minute (60 secs) of complete delivery of foetus. This was repeated after 5 Minutes. Score of 2, 1 or zero was given for presence or absence of the signs as described by V Apgar (1953) Table II gives details of Apgar scoring system. Infant with less than 8 Apgar score was considered in low score and it was an indication for resuscitative measures like inhalation by face mask.

TABLE-II

The evaluation of the newborn infant : Apgar scoring Method

SIGN	SCORE 0	1	2
Heart Rate	Absent	Slow (below 100)	Over 100
Resp effort	Absent	Weak cry Hypoventilation	Good Strong cry
Muscle Tone	Limp	Some flexion of extremities	well flexed
Reflex irritability (Response to skin Stimulation to feet)	No response	Grimace Some motion	Cry
Colour	Blue, Pale	Body pink, extremities blue	Completely pink

Neurobehavioral Examination

The examination is based on the behavioural parameters, their testing procedures and scoring criteria as described by Scanlon et al (1974). In brief the examination involves an assessment of infants various reflexes, muscle tone and power, as well as the response to various stimuli.

The examination was performed on all newborn infants. In this study only those tests were performed which are most easily elicited during the early period of life and lend themselves to quantitative scoring.

The various tests, their testing procedure and scoring criteria are as follows :-

1. Response to pin prick.With the infant supine the sole of the foot is pricked with pin lightly. The response if flexion ie with drawel, generalised limb motion and crying etc. Only magnitude of withdrawel is scored as follows :-

0 - No response

1 - Weak or delayed response

2 - Fairly brisk, perhaps delayed, more vigorous than 1

3 - Vigorous, brisk response.

2. Responds to Sound. Either a bell or rattle is sounded a few inches from infants ear, out of visual range.

0 - No response

1 - Slight change in activity in response to sound.

2 - Some head turning towards sound.

3 - Definite searching, almost immediate response.

3. Muscle Tone (Arm Recoil). The infants forearm is gently extended and suddenly released. The recoil is as follows :-

0 - Absent

1 - Weak Recoil, to as much as 45 degrees

2 - More marked recoil

3 - Very strong, rapid recoil, usually with overshoot.

4. Rooting. The skin of corner of the mouth is gently stroked by a finger. The infant is observed for head turning and lip movements while supine with his head in midline.

0 - No response

1 - Lip movement only, or weak, incomplete head turning.

2 - Full head turn with much lip

3 - Vigorous turning and sucking lip movement.

5. Sucking. Proximal joint of index finger is inserted in the infants mouth.

0 - No response

1 - 1 to 3 Sucks

2 - Strong sucks, 3 to 10 sucks

3 - Long periods of vigorous sucking.

6. More response. Elicited by a rapid, short head drop with the infant in supine position. More response, which is usually observed after first or second stimulus application is scored as follows:-

0 - No response

1 - Slow response with weak arm movements

2 - Moderately rapid response, arm encirclement.

3 - Full rapid response with encirclement.

7. Placing. With the infant in upright position, the leg is raised until the dorsum of foot touches a protruding bassinet

edge. Scoring is based on flexion of the stimulated leg and placing of the stimulated foot on the edge.

0 - No response

1 - Minimal flexion and extension of leg, foot not placed.

2 - Full response, difficutlt to elicit foot placed.

3 - Full response easily and rapidly elicited.

The score of 0 and 1 was considered low score while 2 and 3 as high score.

Assessment of the Mother:-

Assessment of the mothers condition was made on blood pressure, pulse rate and volume of bld loss.

1. Blood Pressure :- A rise or fall of blood pressure by 30 Torr from the original value or systolic blood pressure falling below 90mm of Hg and diastolic below 60mm of Hg was considered poor condition.

2. Pulse Rate. This was assessed by its regularity, rate, rhythm and volume. A count less than 60 beats/mt was considered bradycardia and a rate more than 120 beats/mt was considered tachycardia.

3. Blood Loss. If the assessed blood loss is 1 litre or less was considered normal and more than 1 litre was abnormal.

OBSERVATION AND RESULTS

OBSERVATION AND RESULTS

In this study the following observations were made :-

1. Maternal blood pressure and pulse rate every 2 minutes till the delivery of foetus and adequacy of anesthesia.
2. Volume of blood loss during caesarean section.
3. Apgar score of newborn at 1 minute and 5 minutes.

1. Maternal Blood pressure and Pulse Rate :- Fall in blood pressure of more than 30 Torr systolic from basal level or a reading of less than 100 Torr was taken as hypotension.

Bradycardia was described as a pulse rate less then 60 per minute tachycardia as pulse rate more than 120/minute. In our series none of the patient developed bradycardia. However four parturients - two in group I and one each in group III and IV developed hypotension for varying duration.

A case in general anaesthesia group,a diabetic patient,blood pressure came down upto 70 Torr. Systolic brought upto 104 Torr by increasing rate of I.V. Infusion.Blood pressure remained below 100 Torr for 3 minutes.

A case in spinal group, developed hypotension just after injection of Bupivacaine into subarachnoid space. Blood pressure came down upto 68 Torr systolic and remained below 100 Torr for 5 minutes. Responded satisfactorily to fast I.V. infusion and Vasopressor administration and oxygenation.

In one case of epidural group blood pressure came down upto 80 Torr systolic, was brought above 100 Torr in 2 minutes by fast I. V. Infusion.

A case in general anaesthesia group blood pressure came down upto 70 Torr systolic came upto 110 Torr in 2 minutes after left lateral uterine displacement was done.

A study was done in 55 parturients who were in age group given in Table III. Details about the number of cases who had fall in blood pressure calculated in percentage as well is given in Table IV.

Table III

Table showing distribution of patients according to age.

Age of Patient in years (Range)	Age of patient		Subarachnoid Block GROUP III	Epidural Block GROUP IV
	Spontaneous Resp. (GA) GROUP I	Controlled Ventilation GROUP II		
15 - 20 Yrs	4	3	4	3
21 - 25 Yrs	7	6	8	5
26 - 30 Yrs	3	4	3	2
31 - 35 Yrs	1	2	0	0

Table IV

Fall in Blood pressure in percentage

Fall in Systolic Blood pressure from basal level TORR	Number of cases along with percentage.							
	GROUP I	% age	GROUP II	% age	GROUP III	% age	GROUP IV	% age
0 - 10	2	13.32	3	20.0	4	26.66	2	13.32
11 - 20	1	6.67	0	-	3	20.00	0	-
21 - 30	1	6.67	1	6.66	-	-	1	6.67
31 - 40	0	-	1	6.66	-	-	1	6.67
41 - 50	1	6.67	0	-	1	6.67	-	-
Total	5	33.33	5	33.33	8	53.33	4	26.66

2. Volume of blood loss. The volume of blood loss in mililitres during caesarean section in all the four groups is given in table V along with percentage.

Table V

Volume of blood loss in percentage.

Blood loss in Milliliters	GROUP I	% age	GROUP II	% age	GROUP III	% age	GROUP IV	% age
400 - 500	0	-	5	33.33	3	20.00	5	50.00
501 - 600	4	26.67	5	33.33	4	26.67	3	30.00
601 - 700	4	26.67	5	33.33	7	46.66	2	20.00
701 - 800	1	6.67	1	6.67	1	6.67		
801 - 900	4	26.67	3	20.00				
901- 1000	1	6.67	1	6.67				
More than 1000	1	6.67						
Total	15	100	15	100	15	100	10	100

(i) Only one case in group I when ether was used in spontaneous ventilation that the blood loss was more than 1 litre.

(ii) In most of the cases in groups I & II the blood loss was between 700 to 1000 ml, where as in group III & IV it remained between 400 ml and 700 ml.

3. Pulse Rate. In this study none of the patient had any abnormal pulse. The pulse rate remained within the normal range i.e. between 60 to 120/ml. There was a fluctuation from the initial reading by 15-20-30 counts during intubation and during the delivery of the baby. The table V A has given the detailed account of the initial pulse i.e. pre-operative , per-operative and after delivery record of pulse in all patients with percentage.

Table V A

Pulse rate of patients with percentage

Range of Pulse Rate per minute	Pre-operation								Per-operation								After delivery of baby							
	GP I	%	GP II	%	GP III	%	GP IV	%	GP II	%	GP III	%	GP IIII	%	GP IV	%	GP II	%	GP III	%	GP IIII	%	GP IV	
50 - 60																								
61 - 70																								
71 - 80	5	33.33	4	26.66	2	13.33	3	30.00																3
81 - 90	7	46.66	8	53.33	6	40.00	3	30.00			3	20.00							4	26.66	2	13.33	2	
91 - 100	3	20.00	2	13.33	5	33.33	4	40.00	4		7	46.66	6	40.00	1	10.00	3	20.00	6	40.00	5	33.33	5	
101 - 110			1	6.67	2	13.33			4		3	20.00	5	33.33	6	60.00	7	46.66	5	33.33	6	40.00		
111 - 120									4		2	13.33	4	26.66	3	30.00	5	33.33			2	13.33		
121 and more	15	100.0	15	100.0	15	100.0		100.0	15		15	100.0	15		10		15	100.0	15	100.0	15	100.0	10	

Apgar Score.

Clinical assessment of the neonate was done by Apgar Scoring at 1 minute and 5 minutes interval after birth. Table VI shows apgar score at 1 minute & 5 minutes in various gps.

Table VI

Apgar score at 1 minute and 5 minutes in infants of various groups (Percentage in brackets).

Anaesthesia	Apgar Score					
	1 minute			5 minuts		
	8 - 10	5 - 7	1 - 4	8 - 10	5 - 7	1- 4
General Anaesth Group I (n-15)	12 (80%)	3 (20%)	0 -	14 (93%)	1 (7%)	0 -
General Anaesth Group II (n-15)	13 (86%)	2 (13.33%)	0 -	15 (100%)	0 -	0 -
Subarachnoid block Group III (n-15)	11 (73%)	4 (27%)	0 -	14 (93%)	- (7%)	0 -
Epidural analgesia Group IV (n-10)	7 (70%)	3 (30%)	0 -	10 (100%)	0 -	0 -

n = number of infants in the group.

From the above chart it is evident that the neonates delivered after general anaesthesia have a good initial response to Apgar Score i.e. Apgar Score after 1 minute in comarison to regionalblocks. After 5 minutes the Apgar score is found to be better in regional blocks neonates than in general anesthesia group. Babies of general anaesthesia group were found to be depressed compare to regional block (C.M.Evans, JF Murphy, OP Gray, MRosen 1989 Anaesth. Vol 44. Page (778-782).

The number of infants having Apgar Score of less than 8 at 1 minute in group I, II, III, and IV were 3, 2, 4, and 3 respectively. While at 5 minutes only one each in group I and III. None of the infants and Apgar score of less than 6 and none

required active resusictation mesures like endotracheal intubation and IPPV etc. The average and range of Apgar Scores of infants at 1 minute and 5 minutes in various groups is given in Table VII.

Table VII

Average and rangeof Apgar score at 1 minutes and 5 minutes

General Anaesthi	1 Minute average	Range	5 Minutes average	Range
General Anaesthesia GROUP I	7.8	6-10	9.2	7.10
General Anaesthesia Group II	7.8	6-10	9.3	7-10
Spinal Analgesia Group III	8.6	6-10	9.6	7-10
Epidural Analgesia Group IV	8.1	7-10	9.6	8-10

Neurobehaviour of New born

Assessment of the neurobehaviour of the neonate was done as described earlier.It showed that more than fifty percent infants in each group were normal.Remaining had some weak reflexes during early hours of life .In all the four groups,infants neurobehaviour score improved during each examination with increasig age of the infant . Details about the number of infants with absent or weak reflexes(low score) are given in Table VIII and Percent incidence of low score in table IX.

Table VIII

Number of infants with absent or weak Reflexes(low score in Neurobehavioural)

Age at Examination	Response to Pin Prick				Response to Sound				Arm Recoil				Rooting				Sucking				Placing			
G	I GI(S)	II G(C)	III S	IV E	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
At 1 Minute	6	7	7	4	7	5	6	4	6	5	8	4	7	8	6	5	8	8	5	5	6	5	4	3
After 5 to 1 Hours	3	5	3	1	5	3	2	1	4	5	2	2	5	3	3	3	4	3	2	1	4	5	2	1

GI = General Anaesthesia with a spontaneous vent.
GII = General Anaethesia with controlled Vent .
GIII = Spinal Anaethesia.
GIV = Cpidural Analgesia.

Table IX

Percent Incidence of low neurobehavioural scores

Neurobehavioural Tests	Percent of low scores							
	After 1 Minutes				After 5 Minutes to 1 Hrs			
	GpI	II	III	IV	I	II	III	IV
Response to Pin Prick	30	32	46	40	12	13	8	6
Response to Sound	28	30	40	40	12	13	8	6
Arm Recoil	36	38	53	40	16	13	6	8
Rooting	32	36	40	50	16	13	13	20
Sucking	32	33	50	40	16	13	6	8
Placing	24	26	26	30	12	10	6	10

GpI - General Anaesthesia With spontaneous vent.

GpII - General Anaesthesia with controlled vent.

GpIII - Spinal Analgesia.

GpIV - Epidural Analgesia.

Table X

Cases in which infants had abnormal neurological activity

Case No	Anaesth Group	Maternal Complicating Factors	Maternal hypotension Lowest syst BP(TORR)	Maternal hypotension Duration of Below 100 Torr	Apgar Score 1 mt	Apgar Score 5 mts	Neurobahavioural Response to testing
1.	General	None	None	-	8	9	Weak rooting sucking + Arm recoil
2.	Spinal	None	68	5 mts	6	7	All tested reflexes were weak.
10.	General	Diabetes (Controlled)	70	3 mts	6	8	All tested reflexes were weak.
17.	General	Placenta Praevia	None	-	6	7	All tested reflexes were weak.
27.	General	Obesity (Moderate)	70	2	9	10	Weak rooting Sucking Arms recoil + pin prick.
38.	Spinal	None	None	-	6	8	All tested reflexes were weak or absent (Infants was small for date).
45.	Epidural	None	80	2 mts	8	10	
49.	Epidural	Placenta	None	-	7	9	Weak rooting and sucking.

DISCUSSION

Discussion

A Women in labour poses one of the most critical of all problems to the Anaesthetist . The hazard of two lives has to be considered and either or both of these may already have been jeoparadised by disease or abnormal labour.

There are two special feature of anaesthesia in obstetrics. First,the mother and her unborn child share the same anaesthetic. Second maternal deaths associated with anaesthesia are peculiarly tragic.

With this in mind the present study was conducted on 55 parturients undergoing LSCS, to assess the efficacy of the existing anaesthetic facilities in this hospital as far as the maternal and fetal well being are concerned.

Anaesthesia and the mother

The maternal well being during the study was assessed by the changes in pulse and BP as also the degree of blood loss.

A.G. Davis (1982) reported that G.A. was the prominent cause of maternal deaths most of which were due to aspiration or hypoxic cardiac arrest associated with failed or difficult in intubation

All precaution were taken in the present study to avoid the latter two causes of maternal mortality so that no such catastrophe occured in groups I & II.

Although there was some degree of insignificant fall in the systolic blood pressure in all the groups (33.33% in grps I & II 53.33% in group III & 26.66% in group IV - Table - IV), this fall except in one case in grp I & one in grp III could well be explained on the basis of the elimination of labour pain and apprehension on part of the mother.

One case each in groups I, III and IV had serious fall in blood pressure which were effectively treated by fast I/V fluid Oxygenation and left lateral tilt and vasopressor.

Similarly the pulse rate also showed considerable stability Ranging between 60 - 120/mt. Although there was some fluctuation from the initial reading during intubation or delivery but on the whole it remained quite stable.

It is generally accepted that maternal hypotension adversely affects the neonate by causing foetal depression and has to be avoided at all costs. Many workers (Gaudell 1965), Wollman & Marx (1968), have advocated prehydration in the prevention of maternal hypotension during caesarean section .Cosmi and Marx (1969) compared pre hydration with therapeutic hydration in the prevention of hypotension and found the former to be more effective than the latter.

This compares favourably with our results, where all the patients were prehydrated with 1000 ml of Ringers Lactate, and only 3 patients showed profound fall in their blood pressure.

Patients given G.A. appeared to have consistently more blood loss than those given regional blocks.It was found that blood loss in grps i & II ranged between 700 ml to 1000 ml where as in grps III & iv it was between 400 ml to 700 ml only one case in grp I had blood loss more than 1000 ml.

The exact cause of this disparity is not clearly understood although Moir DD (1970) believes that inhalational. anaesthetics inhibit uterine contraction after delivery and cause more haemorrhage.

Anaesthesia and the Neonate

Anaesthesia administered to mother before delivery affects the foetus in two way :-

1. Foetal central nervous system depression which may follow transfer of drugs accross the placenta.

2. Foetal acidosis may develop secondary to impairment of placental perfusion of maternal hypoxia.

The first factor is intrinsically associated with prolonged general anaesthesia while the second factor constitutes a preventable complications of spinal analgesia.

In the present study 30 cases out of total of 55 cases were administered general anaesthesia. 15 cases were given general anaesthesia with controlled ventilation and 15 cases with spontaneous ventilation the technique used was the standard technique which is most commonly used these days pre-oxygenation for 3 - 4 minutes increases the oxygen saturation and oxygen content of maternal blood and hence indirectly that of foetal blood. This prevents the possible occurrence of oxygen lack when the paitent is being intubated especially if intubation is difficult. Any degree of hypoxia during induction raises the possibility of intrauterine asphyxia of the baby (Donald, 1954).

In this series all the patients were pre-oxygenated to avoid any hypoxia. Standard technique of balanced anaesthesia was used consisting of induction by thiopentone followed by suxamethorium - endo - tracheal intubation and this anaesthsia was maintained on nitrous oxide and oxygen mixture till the delivery of the foetus. This technique is believed to cause least foetal depression (Hodges et al , 1961, hartridge et al, 1963, Crawford, 1966). Hyperventilation and excessive inflatory pressure were avoided

since maternal alkalosis thus produced may cause foetal Hypoxia (Holmen, F. 1963) 15 cases of general anaesthesia were kept on controlled ventilation by giving repeated doses of suxamethonium till the caesarean gets over.

Maternal Hypotension was prevented in cases of spinal analgesia by infusing 540 ml of 5% Dextrose and sodium chloride within 30 minutes before giving the block. This method of infusing 1000 ml of Ringers lactate before giving a block was suggested by Greiss and Crandell (1965). Wollman and Marx (1968). Only one case of spinal analgesia group developed hypotension in which systolic blood pressure came down upto 68 Torr. It was treated with fast intravenous infusion and vasopressor.

Clinically nearly all the infants in our study were vigorous and in good condition immediately after delivery. Only six infants were having Apgar score of 6 at 1 minute and 2 of them having Apgar score of 7 at 5 minutes. Mean Apgar score of newborn at 1 minute in group I 7.6 and in gorup II i.e. 7.8 - which was less than the spinal and epidural group which was 8.6 and 8.1 respectively, but there was no statistically significant difference between the four anesthetic thechniques used on the basis of Apgar score. Mean Apgar score at 5 minutes was 9.2 and 9.3 in general anaesthesia group I & II respectively and 9.6 in both spinal and epidural group.

These data suggest that if properly conducted none of these four techniques in anaesthesia have significant depressant effect on neonates. Downing al (1979) also found no difference in clinical and biochemical status of newborn when he compared conduction block and general anaesthesia for caesarean section.

Although it is the simplest and quickest method of assessment of well being of newborn, reliance on the Apgar score as the sole criterion of neonatal well being or as the sole index of potential effects of perinatally administered drugs was never intended (Apgar, 1953 Apgar and James, 1962) nor does it seem justifiable today in view of the increased sophistication of our knowledge of the complexity of newborn behaviour (Scanlon, 1973 Brazelto (1973) In the present study therefore more complex tests for newborn behaviour were applied to study the effect of agents and technique of anaesthesia used for caesarean section.

Study of lignocaine used for regional analgesia in healthy mothers with full term infants have shown that the motor performance of the newborn is initially depressed for about 12 hrs (Scanlon, 1974) After the age of 1 day, however, there was no difference in the study of Tronicket al (1976). We found a trend to greater depression of rooting and sucking reflexes lasting to 2 days of age. (Hollman et al 1978).

Most commonly used reflexes and the most sensitive indicators of neonatal depression are those related to feeding, namely rooting and sucking. Performance of these was significantly depressed in infants whose mother developed hypotension before delivery.

A severe long lasting decrease in maternal blood pressure can lead to decreased intervillous blood flow, foetal hypoxia and hypotension, decreased cerebral perfusion and neonatal insults (Myers, 1972). In one of our case No 3 Table 10 there was post spinal hypotension, which added to the normal obstetric stress factors acting on the foetus. The chronic decrease in placental blood flow caused by diabetes added to the acute maternal

hypotension could explain the neurologic abnormalities in infants (Case No 10) Table X.

It was observed that even short lived maternal hypotension alone resulted in neurologic abnormalities (Case No 45) This finding was in contrast to that observed by Rorke et al (1982) who found that a short period of hypotension does not affect the neurobehavioural well being of the neonate.

Chronic antenatal stresses such as diabetes, pregnancy induced hypertension which decreases placental blood flow during late pregnancy, combined with the acute stress of abdominal delivery, seem to depress the neurologic activity of an infant. In our study all infants of high risk obstetric patients showed abnormal neurologic recovery independant of anaesthetic technique where as infants of mothers with no complicating factor generally did well. These finding are similar to those of Hollman et al (1978).

CONCLUSION

CONCLUSION

After the study completed and data analysed the following conclusion was derived at :-

(1) The maternal blood loss was more in general anaesthesia group especially in patients under ether anaesthesia in comparison to parturients who had caesarean section under regional blocks.

(2) Maternal blood loss in groupI and group II (General anaesthesia) varied between 700 ml and 1000 ml while it ranged between 400 ml to 700 ml when regional blocks were given (Group III Spinal anaesthesia and group IV epidural analgesia)

(3) In the group III and IV recieving spinal analgesia and epidural analgesia there was a significant correlation between maternal hypotension and weak rooting and sucking reflexes of the infants during first day.

The group III and IV patients when prophylactically preloaded with two bottles (1000 ml) of ringers lactate and preoxygenated along with left lateral tilt till the delivery of the infant the blood pressure was maintained through out the period of surgery. This gave good apgor score to the new born.

(5) The hypotension of less than 2 - 3 minute was not found to be harmful to the neonate.

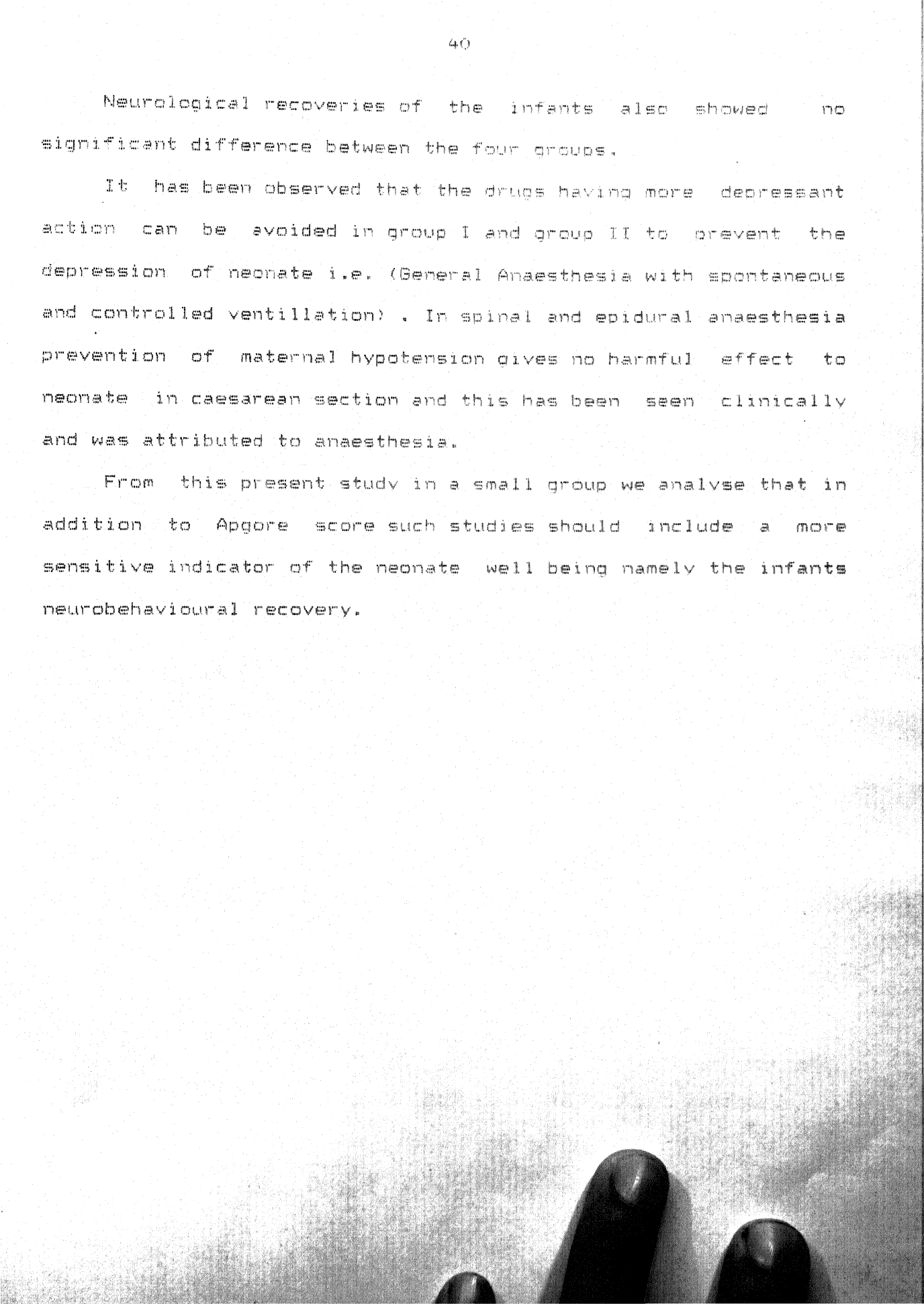
(6) All infants of high risk obstetric patients (diabetes, obesity) in the study independant of anaesthesia technique used had abnormal neurological activity as evident by depression of muscle tone and the reflexes.

(7) In general all neonates were vigorous and in good clinical condition at birth, Apgore score showed no significant difference between the four groups.

Neurological recoveries of the infants also showed no significant difference between the four groups.

It has been observed that the drugs having more depressant action can be avoided in group I and group II to prevent the depression of neonate i.e. (General Anaesthesia with spontaneous and controlled ventillation) . In spinal and epidural anaesthesia prevention of maternal hypotension gives no harmful effect to neonate in caesarean section and this has been seen clinically and was attributed to anaesthesia.

From this present study in a small group we analyse that in addition to Apgore score such studies should include a more sensitive indicator of the neonate well being namely the infants neurobehavioural recovery.



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